Work Scope and Contract Amendment Proposal for:

Evaluation of Wildlife Crossing Structures and Fencing on US Highway 93 Evaro to Polson

Phase I: Pre-construction data collection and finalization of evaluation plan

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PROBLEM STATEMENT

Highways have direct and indirect ecological effects on wildlife. The most obvious direct effect is animal mortalities due to collisions with vehicles; these incidents also affect the driving public's safety. Indirectly, highways and high traffic volumes bisect habitat and can impair or prevent animal movements across the landscape to meet daily or seasonal needs for food, water, secure cover and reproduction. Animal-vehicle collisions (AVCs) and highway fragmentation of habitat are safety and ecological concerns that deserve attention as the transportation field strives to improve highway infrastructure.

Installations of fencing, crossing structures and animal detection-driver warning systems have been applied to some extent in the past to mitigate the impacts of highway-wildlife interactions, but conclusive information about the effectiveness of these methods is minimal (Clevenger 2001). There is a need for monitoring and research to better understand how mitigation deployments affect animal-vehicle collisions and animal movements across roads. As departments of transportation invest in mitigation efforts, the quantification of benefits in relation to the costs will provide accountability to guide future applications of mitigation techniques.

On December 20, 2000 the Confederated Salish and Kootenai Tribes (CSKT), the Federal Highway Administration (FHWA), and the Montana Department of Transportation (MDT) signed a Memorandum of Agreement (MOA) allowing the reconstruction of 46 miles (74 km) of US Highway 93 (US 93) from Evaro to Polson (the MOA does not address the Ninepipe area, a 10 mile [16 km] segment of the 56 miles [90 km] of US 93 between Evaro and Polson, which is currently under evaluation through a supplemental environmental impact study). The MOA commits to a reconstruction design that incorporates installations of 42 fish and wildlife crossing structures and 15 miles (24 km) of wildlife-proof fencing for a total investment of over $9 million. The US 93 mitigation is unprecedented in terms of the level of effort and the approach of using segments of fencing perforated with crossing structures on an uncontrolled-access highway.

The MOA commits to monitoring and evaluating the effectiveness of the wildlife crossings and fencing. The information obtained from monitoring the improvements on US 93 is pivotal to future decisions nationwide regarding wildlife crossing structure and fencing installations. It is important that a scientifically based research plan be implemented to evaluate the effectiveness of the US 93 wildlife crossing structures, and that the evaluation results are developed into best management practices for other wildlife-highway impact mitigation projects.

The first step in the evaluation of the US 93 wildlife fencing and crossing structures, pre-construction baseline monitoring, is currently underway. The Western Transportation Institute (WTI) at Montana State University (MSU) was contracted in March of 2002 to oversee the pre-construction data collection with funding provided through the FHWA Streamlining and Environmental Stewardship Initiative and matching MDT funds. It is essential to follow this baseline data collection with post-construction monitoring; by comparing pre-construction data to post-construction data, the effect of the crossing structures and fencing on animal-vehicle collisions and animal crossings of US 93 will be quantified, effectiveness judged, and best

management practices developed accordingly. The post-construction phase of the project has yet to be funded.

BACKGROUND SUMMARY

The US 93 reconstruction project crosses the Flathead Indian Reservation along the west side of the Rocky Mountains, with the Mission Mountains to the east and the Flathead Valley to the north. This land is the home of the CSKT of the Flathead Nation. The Flathead Reservation is also home to various wildlife species such as grizzly bears, white-tailed deer, mule deer, pronghorn antelope, elk, coyote, painted turtles, bighorn sheep, numerous fish and bird species, waterfowl, amphibians, and reptiles.

Since the inception of reconstruction proposals for US 93 over a decade ago, concerns about impacts of highway reconstruction on resident wildlife populations have spurred related research on US 93. Becker (1996) researched the effects on wetland and riparian habitat. Fowle (1996a, 1996b) addressed painted turtle migration and mortality. Based on landscape and grizzly bear habitat modeling, the Evaro Hill area on US 93 north of Missoula has been highlighted as the single corridor and linkage zone connecting the Bitterroot/Selway area and Mission mountains/Bob Marshall area grizzly bear populations (Mietz 1994). Servheen et al. (1998) demonstrated that high-speed highways such as US 93 have adverse effects on grizzly bears, by inhibiting movements, genetic and demographic exchange and increasing mortality. Beyond the studies of the effects of US 93, large libraries on general effects of roads on wildlife and ecology exist (Singleton 1998) and additional research is published regularly.

Throughout the US 93 reconstruction design discussions that formed the basis for the MOA, the CSKT emphasized the importance of maintaining their cultural and homeland integrity. Out of respect to the holistic spirit and nature of the CSKT community, these design discussions prioritized protection of natural processes such as hydrologic function, seed/plant dispersal, and movement of fish and wildlife between habitat areas. As a result, fish and wildlife crossings became a major focal point as a mitigation measure in the US 93 reconstruction design discussions. The cooperating agencies, consulting engineers from Skillings-Connolly, Inc., and landscape architects from Jones and Jones Architects and Landscape Architects met with wildlife biologists to develop the Wildlife Crossings Workbook (http://www.skillings.com/Web-Page/Wildlife.html) and Design Guidelines and Recommendations (http://www.skillings.com/Web-Page/027DG.pdf). The concepts outlined in these documents were committed to in the MOA.

Specifically, the MOA commits to the Wildlife Crossings Workbook recommendations, which include installing several segments of wildlife-proof fencing along a total of 15 miles of US 93, with 42 wildlife crossing structures perforating the fenced areas to allow animals to safely pass under or over the traffic. The recommendations were modeled after the wildlife crossings and fencing installations on the Trans-Canada Highway in Banff National Park, Alberta, Canada. The US 93 wildlife crossing structures were placed by synthesizing research about wildlife

crossing structures and fencing with local knowledge and data of winter and summer game trails, road kills, habitat, and engineering practicality.

The MOA Design Guidelines and Recommendations state the importance of developing, "a monitoring system for all major wildlife crossings in order to document usage and to collect data that can be used for other similar projects." MDT contacted WTI to discuss the development of the wildlife crossing monitoring and evaluation. WTI met with MDT personnel from the environmental division; Dale Paulson, FWHA; and Dale Becker, CSKT Wildlife Biologist, on two occasions in April, 2001. The consensus of these meetings was that, (1) pre- and post-construction monitoring and evaluation of the crossing structures and fencing must be done on the US 93 Evaro to Polson Project, (2) the evaluation of the mitigation must produce best management practices, (3) the research work completed and sources of funding for this project will probably involve several different entities, and (4) MDT and CSKT would like WTI to coordinate and manage this research effort.

FHWA granted $250,000 Streamlining Initiative funding and MDT provided $62,500 match and administered the contract to WTI to initiate the pre-construction baseline data collection (Phase I) in March 2002. Recognizing that the pre-construction monitoring forms the basis of the entire evaluation and that the initial allotment of funding allows for only minimal pre-construction data collection effort, FHWA and MDT are allocating an additional $200,000 and $50,000, respectively, to the pre-construction phase of the evaluation, for a total budget of $562,500 for the pre-construction phase of the study.

This proposal is being submitted to MDT to amend the March 2002 contract with a new schedule, tasks, and deliverables that will be realized with the additional funding. This document builds off the original work scope and only addresses the pre-construction monitoring study. The post-construction work plan will be developed as a part of this work scope but aside from that, this work scope and contract do not include other post-construction tasks or funding. The remainder of this proposal will consist of a complete work scope that can replace the original pre-construction work scope.

OBJECTIVES

The goal of the evaluation project is to assess whether the installation of wildlife fencing and crossing structures on US 93 improves driver safety and allows animals to move safely across US 93, and to document lessons learned throughout design, construction, and monitoring. Specific objectives of the evaluation project are as follows:

- Determine what effect US 93 wildlife crossing structures and fencing have on the frequency of
    - animal-vehicle collisions,
    - successful animal highway crossings; and
- Identify best management practices and further research.

BENEFITS

The US 93 wildlife crossing structure evaluation will comprehensively contribute to better applications of wildlife fencing and crossing structures. Benefits that will be realized from this effort include the following:

- Data to quantify if fencing and crossing structure applications on US 93:
    - Increased driving public safety by:
        - Reducing animal-vehicle collisions
        - Accommodating animals under or over road, rather than on the road
    - Reduced highway ecological impacts by:
        - Reducing wildlife road mortality
        - Increasing biological connectivity for fish and wildlife populations
- Increased public education and awareness of efforts to minimize the effects of roads on natural resources
- Best Management Practices Document, based on evaluation outcomes, that will guide applications of wildlife fencing and crossing structures on future highway projects.

RESEARCH PLAN

WTI established a Research Oversight Committee (ROC) to help steer the research approach. The ROC consists of a small group of dedicated experts and stakeholder representatives. The purpose of the ROC is to review all paper products, impart expertise to guide research direction, and provide technical advice. The following stakeholder representatives are committed to serving on the ROC:

Dale Becker, Wildlife Biologist, CSKT

Pat Basting, Missoula District Biologist, MDT

Sue Sillick, Project Manager, MDT

Paul Garrett, Wildlife Biologist, FHWA

Tony Clevenger, Wildlife Biologist, WTI

Discussion with the ROC during the onset of Phase I determined that deer and black bear were two wildlife species to consider specifically focusing on their local presence, abundance, distribution and movements. With the available budget, WTI has subcontracted a black bear study, but was not able to cover a deer study as well.

The ROC selected three study sites at the southern end of the US 93 corridor on which to focus this intensive monitoring. The Evaro, Ravalli Curves, and Ravalli Hill study sites were chosen because these areas will have the longest segments of fencing, perforated with wildlife crossings under or over the road. Fencing will not extend between these sites. Designing fenced and non-fenced sections along the same highway has not been extensively applied previously and there is particular interest in what may occur at the ends of fencing segments. The Evaro, Ravalli Curves and Ravalli Hill study sites will provide the best data to address how segments of fencing with crossing structures affect animal-vehicle collision and road crossing rates and locations.

The construction schedule determines when pre-construction monitoring can occur in the identified project study areas. Currently, construction is slated to begin in Evaro in spring 2004, followed by Ravalli Curves in spring 2005, and Ravalli Hill in spring 2006. Given this schedule, pre-construction monitoring activities will occur until spring of 2006 and the final report will be finished by the end of June 2006. At that point, the Evaro area construction should be complete and Phase II, or post-construction monitoring, can be contracted and post-construction monitoring could begin in that area.

The schedule and deliverable dates from the original March 2002 scope have been extended. This pre-construction study will require post-construction monitoring in order to complete the scientific evaluation. The "Phase I: Pre-construction data collection and finalization of evaluation plan" revised scope and budget for the lump $562,500 includes the following tasks and products, many of which serve as the base-line of the study:

- TASK 1—Project Management, Coordination and Reporting

- TASK 2—Animal-Vehicle Collision Database
- TASK 3—Tracking Bed Methods to Estimate Animal-Road Crossing Rates
- TASK 4—Field Methods and Safety Protocol Handbook
- TASK 5—Summary of Literature and Existing Data
- TASK 6—Memo Defining Measures of Effectiveness (MOEs)
- TASK 7—Final Integrated (Pre- to Post-construction) Monitoring Plan
- TASK 8— Environmental Streamlining Design and Monitoring Case Study
- TASK 9—Pre-construction Black Bear Movement and Genetics Study
- TASK 10—Final Synthesis Report

Work Task 1 – Project Management, Coordination, and Reporting

Project Management will be overseen by WTI, with WTI serving as the project's central contact point. As such, WTI acts as the liaison between the ROC and other research partners. This task involves directing and integrating the project to achieve objectives while adhering to time and budget constraints; procurement of funding and administration of work scopes and subcontracts; coordination with research partners; coordination with the US 93 Technical Design Committee; and reporting updates quarterly and annually.

The ROC and Project Management will work together to steer the evaluation project. WTI will comprehensively direct, schedule, and budget the evaluation project in an accountable manner. This responsibility will include developing work scopes and administering sub-contracts to be accomplished through qualified research partners. Work scopes will include budgets; timelines, and deliverables, such as annual reports and a final report.

WTI will collaborate with research partners to accomplish project tasks. Potential partners may include other WTI staff (beyond project management); CSKT Tribal Staff; MSU; UM; Salish Kootenai College (SKC); American Wildlands; Montana Fish, Wildlife and Parks; and the Wildlife Conservation Society (WCS). Other partners might include other city/county/state agencies, private consultants, and other parties involved with wildlife-transportation interactions. In addition to coordinating resources directly involved in this project, WTI will contact other researchers conducting studies in the US 93 study area to ensure a synergistic approach to all wildlife research in the area.

WTI will coordinate with the US 93 Technical Design Committee (TDC) in order to incorporate monitoring considerations into construction designs. Concepts that are being incorporated into the designs include tracking beds inside and outside crossing structures and equipment (posts, brackets) for mounting cameras inside the under-crossings and atop the over-crossing. WTI is committed to working with the TDC through the iterative process of detailing design concepts,

providing input on wildlife crossing structure and fencing designs, and landscaping issues when needed.

WTI will provide the funding agencies with progress reports. January, April, July and October of each year, WTI will complete the FHWA quarterly report form and deliver it to Sue Sillick for her to review and send on to FHWA. Quarterly reports will briefly summarize the project's progress. Detailed annual reports will compile these quarterly reports, review the budget from the reported year, refine the budget projections, and summarize data collection from the year prior.

Work Task 2 – Animal-Vehicle Collision Database

Tracking animal-vehicle collisions (AVCs) before and after construction is essential to achieving the project goals. WTI will research all potential sources of historic and current information related to AVCs (date, location, and species of animal involved). Potential sources of this information include MDT (Safety and Maintenance Divisions), CSKT (Game Warden and Wildlife Divisions), and collaborating researchers (Kathy Griffin from University of Montana). WTI will compile all available AVC data into a database after screening for quality of information (longevity and consistency of monitoring effort is important) and eliminating duplicate AVC events.

In July 2002, MDT's Safety Office provided WTI with animal-vehicle collision data from Montana Highway Patrol records (from 1992-2001) and MDT Maintenance records of carcass removals from the road (from 1998-2001). In March 2003, MDT provided additional AVC data for 2002. WTI has been working with CSKT staff to gather additional AVC data. The product delivered in May 2003 will consist of the framework for the database and the data compiled to date. WTI will continue to collect AVC data from MDT and other sources throughout the study and will include the database in the final synthesis report.

Outside of this workscope and budget, WTI and the Wildlife Conservation Society have teamed to offer a qualified Native American student a graduate fellowship at MSU. At this point, the student's thesis topic will probably entail working with the AVC data to identify trends in the pre-construction data with regard to landscape, highway, and anthropomorphic characteristics of the AVC sites. With this information, WTI hopes to create a priori hypotheses regarding potential changes in rate and site characteristics of post-construction AVC incidences.

Work Task 3 – Tracking Bed Methods to Estimate Animal-Road Crossing Rates

One of the goals of the project is to compare the animal road-crossing rates before and after the mitigation measures are installed in order to assess how well the wildlife fencing and crossing structures accommodate wildlife movements from one side of the road to the other. After considering a variety of methods to quantify crossing rates, WTI will estimate pre-construction crossing rates in the Evaro, Ravalli Curves, and Ravalli Hill areas using tracking beds placed parallel to, and a few meters from, US 93 to record tracking events of animal approaches and crossings of the road.

In the winter of 2002-2003, WTI conducted a pilot study to address the feasibility of using tracking beds to estimate the pre-construction rate of animals crossing US 93. We placed two 100-meter long tracking beds directly across the road from each other and monitored the beds for tracking events. Some anticipated inconsistencies of this methodology emerged. First, the precipitation and cold temperatures of the winter months effectively froze the tracking media, creating known periods when animals may have crossed the bed but did not leave tracks. Second, by having two beds across the road from each other, we saw that not all animals that approached the road appeared to successfully cross the road. Some animals approached and left tracks that paralleled the road or turned around, while other animals crossed the tracking bed moving toward the road but did not leave tracks in the tracking bed on the other side of the road. Despite these limitations of the methodology, the overall conclusion was that this method is feasible if we use additional measures to adjust for the discrepancies identified in the pilot study.

Each tracking bed site will consist of a 100 meter x 1.5 meter sheet of Amoco unwoven filter fabric (4545) underlying a 7:1 mixture of sand and 1/8" crushed aggregate material. Each site will be randomly located along, and on either side of, the road; running parallel to, and ~6' from the edge of the pavement. Most sites will have a single tracking bed to record track occurrences on one side of the road; each tracking event (a set of tracks left by a single animal) that crosses the bed will be considered an "approach" to the road.

Additional procedures will be incorporated into the tracking bed study design as correction factors for the shortfalls identified in the pilot study. WTI will purchase an IR video recording system (using WTI funding outside of this contract) to record crossing events 24 hours a day at the tracking beds. The video system will be randomly rotated among all of the tracking bed sites and will record wildlife events occurring at each site for 6-10 days, depending on the system's power capabilities. Events captured on video, such as animals crossing the tracking bed and successfully or unsuccessfully crossing the road, lingering along the road (perhaps to feed along the right of way), or avoidance of the tracking beds will be considered as we analyze tracking bed data. We hope the video observations will provide a correction factor for tracking data by correlating discrepancies to weather conditions, and by estimating how often an animal approaching the road actually successfully crosses the road. Additionally, about 5 sites will have a second bed directly opposite the first bed across the road to estimate how often a track on one side of the road results in a successful crossing versus an unsuccessful crossing.

WTI consulted with colleagues and searched published literature to find similar data on animal-road crossings to conduct a power analysis to determine a sample size that will allow us to detect statistical differences from the pre-construction estimated crossing rate to the post-construction absolute crossing rate. We used Dr. Sarah Barnum's tracking data from her dissertation study on I-70 Vail Pass, Colorado. The power analysis indicated that we should be able to detect differences if we sample approximately 30% of the areas that will have wildlife fencing, which amounts to 2500 meters in the Evaro area; 2000 meters in the Ravalli Curves area; 1700 meters in the Ravalli Hill area. The results of the power analysis will be reported in the 2003 annual and final synthesis report.

WTI expects to have tracking beds place in the Evaro area in May 2003, followed by the Ravalli Curves and Hills areas sometime during the summer of 2003. WTI will work with Doug Moeller, MDT Missoula District Maintenance Foreman, and the Evaro and Ravalli District

Maintenance staffs to approve a logistical plan for necessary traffic control as trucks will partially block traffic on US 93 when dispensing the tracking material at each tracking bed site.

Note: Post-construction wildlife crossings of US 93 will be simpler to document. Once the wildlife fencing and crossing structures are in place, tracking beds will be installed both in- and outside of the structures. The beds inside the crossing structures will not be exposed to weathering that can cause tracks to disappear. These beds will provide a measurement of the absolute use of the crossing structures while the beds outside the crossing structures will enable us to make a comparison with the animal crossing rates before construction. Motion- and heat-triggered cameras will be set up at the ends of the fence to document end runs. Statistically quantifiable comparisons between pre- and post-construction data of crossing events in these areas will provide the basis to assess how well the fencing and crossing structures provided safe passage of animals across the road.

Work Task 4 – Field Methods and Safety Protocol Handbook

WTI will create a handbook of the standardized pre-construction field methods. This handbook will include detailed procedures for collecting field data on animal-vehicle collisions and animal crossings of the highway. Safety protocols, sampling schedules, logistics, local contacts, and technical instructions for using and maintaining equipment (IR video system, heat/motion triggered cameras, GPS units, digital still cameras) will be included. Although this handbook will have specifics related to the study area, it is expected that the general approach to the pre-construction data collection methods will be applicable beyond this project.

Work Task 5 – Summary of Literature and Existing Data

WTI will serve as project librarian, compiling literature, data, quarterly and annual reports, and final products resulting from the various work orders. A final summary of the literature and data will include the following components: 1) a bibliography of published papers relating to wildlife crossing structures and fencing design, placement, and methods to evaluate effectiveness; 2) a summary of existing data on wildlife populations, US 93 wildlife mortalities, and current wildlife research occurring in the study area; and 3) a summary of relevant research currently underway on the Flathead Reservation.

Work Task 6 – Defining Measures of Effectiveness (MOEs)

WTI will establish MOEs based on published literature, expert opinion, and transferability to other wildlife crossing structure and fencing mitigation projects. MOEs will be tied to the data collection techniques and analyses and will integrate biologically and statistically important factors to define how the results of the study will be interpreted in terms of changes in AVC and animal crossing rates.

Work Task 7 – Final Integrated (Pre- and Post-construction) Monitoring Plan

The monitoring plan will integrate the pre- and post-construction monitoring and data collection efforts to ensure MOEs are applicable across all phases of the project and that the evaluation can

accomplish the project goals. This plan will provide a basis for the post-construction contract and work scope and will outline any additional monitoring equipment that may be required.

Work Task 8 – Environmental Streamlining Design and Monitoring Case Study

The case study will cover the successes, trials, and errors that will occur during the pre-construction design process and establishment of wildlife monitoring techniques. The case study will serve as a guide for other road construction projects incorporating wildlife mitigation with the hopes that experiences gleaned from the US 93 reconstruction will help future projects move through the planning, compliance, and design phases efficiently and effectively, with consideration for ecological connectivity. Future phases of the case study (outside of this scope) can include lessons learned during construction (Phase II) and post-construction monitoring, and the project's overall success at lowering AVCs and increasing the highway's permeability to animals (Phase III).

Work Task 9 – Pre-Construction Black Bear Movement and Genetics Study

WTI sub-contracted a pre-construction study of black bear movements and genetic distribution in relation to US 93 to Dr. Chris Servheen at the University of Montana. Dr. Servheen selected masters student candidate Karin McCoy in June 2002 to work on the project.

Eight black bears were radio-collared in the Evaro and Ravalli areas in June 2002. The radio collars use Global Positioning System (GPS) store-on-board technology to collect specific locations every hour, 24 hours a day, for approximately 170 days per year. The collars collected numerous GPS locations each day until October, at which time a release mechanism dropped the collar from the animal and VHF telemetry enabled retrieval of the collar and bear location data. Analysis of movements will include distance between locations at various distances from the highways; and distance to highway in relation to time, season, age, sex, and daily vehicle volumes in order to understand if the pre-construction condition of US 93 might be a barrier to black bear movements.

McCoy has summarized the location data thus far and presented it in her quarterly reports. In summer 2003, McCoy will repeat the GPS/VHF radio-collar study and deploy a sampling grid of bear hair snare sites in the study areas. These sites serve to collect black bear hair on both sides of the road. DNA in the roots of the collected hair will be extracted and analyzed for 14 loci. With these data, an assignment test to compare genetic relatedness will determine the number, sex, and direction of movements of individuals across the highway. Results of the pre-construction assignment test will establish a baseline that can be used for future comparison of such data to help assess changes in genetic connectivity after road improvement. In addition to the empirical data collected above, the study will also assess the likelihood of genetic divergence in black bears due to the road, as well as other theoretical explanations for genetic divergence or lack of movements across US 93.

McCoy is expected to complete fieldwork in the fall of 2003, lab work in fall 2003, and the thesis in December 2003. WTI will include a summary of this study's findings in the final synthesis report. This study will be repeated post-construction in order to assess how the mitigation affects black bear movements and distributions.

The pre-construction black bear study will serve as a baseline and, combined with a post-construction follow-up study, the two studies together will provide a comparison of movement patterns, habitat use, and genetic relatedness of black bears in relation to US 93 pre- and post-installation of fencing and crossing structures on the south end of the US 93 road corridor. With comparative data, the mitigation deployments can be evaluated in terms of how well they accommodated black bears. To some degree, black bears can serve as a surrogate to grizzly bears, and the best management practices that stem from the results of these studies may help better accommodate grizzly bears, a species of special concern that can also share similar areas near US 93.

Work Task 10 – Final Synthesis Report

This task will integrate the information and conclusions derived from the other tasks into a final report. This report will include following chapters:

- Executive Summary
- Introduction
- Study Area
- Measures of Effectiveness (MOEs)
- Pre-construction Methods (with the Handbook as an Appendix item)
- Pre-construction Results (summarized relative to the MOEs)
    - AVC rates and trends in AVC site characteristics
    - US 93 crossing rates
- Post-construction comparative Hypotheses
- Post-construction Methods (relative to MOEs and hypotheses)
- Discussion
- Bibliography
- Appendices
    - Environmental Streamlining Design and Monitoring Case Study
    - Field Methods Handbook
    - Additional Literature

Two versions of the synthesis will be produced: a detailed paper and an executive report summary. A draft will be delivered to MDT for review in April 2006 and will be finalized by June 30, 2006.

PRODUCTS

Phase I pre-construction products include the following deliverables:

- Quarterly and annual reports (Task 1). Quarterly reports will be submitted electronically to Sue Sillick by October, January, April, and July 25th of each year until the completion of this project. Annual reports will summarize the previous calendar year's progress and will be submitted to Sue Sillick by December 31st of 2003, 2004, and 2005.

- Summary of literature and existing data (Task 1). This task will occur throughout the project. WTI will submit the cumulative compilation of citations and related data in each annual report. This compilation of information will be included in the final report as an appendix item.

- Project library of contacts, data, and relevant literature (Task 1). All electronic products and paper sources derived or compiled from this project will be delivered to MDT with the final report in June 2006.

- Animal-vehicle collision database (Task 2). This database will be a work in progress throughout the project. WTI will submit the cumulative data compiled in the database in each annual report. A summary of the data will be incorporated in the final synthesis report, while the database will be included in the project library that will be submitted at the end of the project.

- Field Methods and Safety Protocol Handbook (Tasks 2,3,4). A draft of the handbook will be sent to the ROC and MDT for review in spring 2004. After revisions, the final handbook will be used to finalize the monitoring plan and to guide field technicians with data collection. The Handbook will be included in the final synthesis report as an appendix item.

- Memo defining the Measures of Effectiveness (MOEs; Task 6). A draft of this document will be submitted to the ROC and MDT by spring 2004. Revisions will be incorporated and the MOEs will be completed by October 2004. This report will be included as a chapter in the final synthesis report.

- Final Integrated (Pre- to Post-construction) Monitoring Plan (Task 7). A draft of the monitoring plan will be submitted to MDT in July 2005, and the final will be delivered in September 2005. The plan will include tasks, budgets (including equipment needs) and schedules. The 2005 delivery date should allow MDT ample time to prepare the 2006 post-construction contract so that there is a smooth transition from this contract to the

post-construction contract. The final monitoring plan will also be included as a chapter in the final synthesis report.

- Environmental Streamlining Design and Monitoring Case Study (Task 8). The Technical Design Committee (TDC) will end their meetings at the end of 2003; WTI will submit a draft of the case study to TDC members (as requested by the TDC) by July 2004, and a final case study to MDT by October 2004. The case study will be included in the final synthesis report as an appendix item.

- Pre-construction Black Bear Movement and Genetics Study (Task 9). The thesis will be completed by December 2004. WTI will submit a draft summary of the results to MDT in April 2005, revise it for the 2005 annual report, and include the summary in the final synthesis report.

- Final Synthesis Report (Task 10). This report will pull all previous products, including cumulative summary of data, together into a comprehensive report. A draft will be submitted to MDT by April 30, 2006 and the final report will be delivered, with the library of products and data, by June 30, 2006.

Each product will be allotted initial and final review periods with appropriate MDT staff before being released to other entities. All of the above final products will be assembled into integrated and searchable electronic and paper formats and delivered to MDT by the end date of the project.

TIME SCHEDULE

The construction schedule determines when pre-construction monitoring can occur in the identified project study areas. Currently, construction is slated to begin in Evaro in spring 2004, followed by Ravalli Curves in spring 2005, and Ravalli Hill in spring 2006. Given this schedule, pre-construction monitoring activities will occur until spring of 2006 and the final report will be finished by the end of June 2006. At that point, the Evaro area construction should be complete and Phase II, or post-construction monitoring, can be contracted and post-construction monitoring could begin in that area. A charted schedule of "Phase 1: Pre-construction data collection and finalization of evaluation plan" is summarized in Table 1, below.

Table 1. Schedule for pre-construction monitoring tasks.

Year	2002												2003												2004												2005												2006					
Month	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J
T1: Project Management																																																						
T1: Quarterly Reporting																																																						
T1: Annual Summary Rpt																																																					
T1: TDC Collaboration																																																					
T2: AVC data collection																																																					
T3: Track Bed Methods																																																					
T4: Field Handbook																																																					
T5: Compile Data & Lit																																																					
T6: Define MOEs																																																					
T7: Final Monitoring Plan																																																					
T8: Case Study																																																					
T9: Black Bear Study																																																					
T10: Final Synthesis Rpt																																																					

STAFFING

Principal technical staff that will be involved in this project are listed below.

Amanda Hardy, MSc.

Amanda Hardy, Principal Investigator, will coordinate all aspects of the long-term evaluation project, serving as the central contact point for project management. She will serve in most capacities of the tasks to be performed*, and will also delegate tasks to other staff.

Amanda is a research ecologist with the Western Transportation Institute at Montana State University. She obtained a B.Sc. in Biology, Fish and Wildlife Management, at Montana State University, in 1997, and M.Sc. in Ecology, Fish and Wildlife Management at Montana State University in 2001. Throughout her career in the natural sciences, research, and resource management, Amanda has worked on field studies of bear use of spawning streams, coyotes, wolves, elk, bison, pronghorn, amphibian surveys, non-native plant control, snow dynamics studies, and as a fire behavior and weather specialist. Her skills include ground tracking; radio telemetry; capturing, handling, and conducting minor operating procedures and necropsies of animals; study design; data management; quantitative analyses; technical writing and presentation delivery. Amanda is currently involved in numerous national efforts to incorporate ecological issues into transportation planning, design and construction management practices.

*WTI may hire a field technician for fieldwork duties that Ms. Hardy and Dr. Huijser are currently establishing and conducting.

Marcel Huijser, PhD

Dr. Huijser, WTI Ecologist, will assist Ms. Hardy as Co-Principal Investigator. Dr. Huijser will work with Ms. Hardy to establish study design and sampling protocols, and with fieldwork*, writing, editing, analyses, and compiling literature.

Dr. Marcel Huijser is a research ecologist at the Western Transportation Institute at Montana State University. His skills lie in the areas of animal ecology, vegetation science, plant-animal interactions and landscape ecology, and he is a specialist in the ecological aspects of infrastructure. Related to this effort, Marcel has performed numerous studies regarding the effect of infrastructure on wildlife and how these effects could be mitigated. Examples of these studies are a project that addressed the effect of the spatial arrangement of certain landscape elements on the movement patterns of animals in zones directly adjacent to roads and a project that evaluated three scenario’s for habitat linkages in landscapes fragmented by agriculture and infrastructure. Given his extensive experience in the field of infrastructure and ecology in Europe and North America, Marcel will be a valuable asset to this investigation.

*WTI may hire a field technician for fieldwork duties that Ms. Hardy and Dr. Huijser are currently establishing and conducting.

Dr. John Borkowski

Dr. Borkowski will oversee study design and statistical analyses. Dr. Borkowski is a statistician at Montana State University in Bozeman and has been working with biologists in the MSU Ecology Department for the past several years.

Jeralyn Brodowy

Jeralyn Brodowy, WTI Business Manager, will handle the accounting and contracting documents. MSU Grants and Contracts will also assist with contract development and accounting.

Administrative and Student Support

Editing, word processing and graphics development will be provided by staff at the Western Transportation Institute. Undergraduate and graduate students may be employed to assist on research tasks for this project as well.

PROJECT BUDGET

The budget is summarized in several tables. Table 2 shows what months of each calendar year fall into the federal and state fiscal years, respectively. Table 3 shows the total estimated expenditures for the federal and state fiscal years. The remaining tables show a detailed breakdown of state fiscal year expenses, year by year. Each state fiscal year budget is followed by a second table that further details the "other direct costs" (non-labor expenditures) for that given year.

Table 2. Months that fall into federal and Montana state fiscal years, respectively.

Federal Fiscal Years	Start & End Dates	Duration (mo.)
FY-02	3/1/02 to 9/30/02	7
FY-03	10/1/02 to 9/30/03	12
FY-04	10/01/03 to 9/30/04	12
FY-05	10/1/04 to 9/30/05	12
FY-06	10/1/05 to 6/30/06	9
State Fiscal Years	**Start & End Dates**	**Duration (mo.)**
FY-02	3/1/02 to 6/30/02	4
FY-03	7/1/02 to 6/30/03	12
FY-04	7/1/03 to 6/30/04	12
FY-05	7/01/04 to 6/30/05	12
FY-06	7/01/05 to 6/30/06	12

Table 3. Estimated total expenditures for the federal fiscal years of the study.

	Federal Fiscal Years					Totals
	FY-02	FY-03	FY-04	FY-05	FY-06	
Salaries	$23,090.28	$38,066.23	$31,833.86	$28,091.32	$18,735.71	$139,817.40
Benefits (27%)	$6,234.38	$10,277.88	$8,595.14	$7,584.66	$5,058.64	$37,750.70
In-State Travel	$4,490.44	$8,806.22	$5,625.00	$4,625.00	$3,750.00	$27,296.65
Supplies, Commun.	$23,269.25	$57,975.70	$3,660.00	$3,474.25	$2,255.25	$90,634.45
Subcontract	$29,870.33	$104,458.98	$49,473.25	$14,787.75	$0.00	$198,590.30
Total Direct Costs	$86,954.67	$219,585.01	$99,187.25	$58,562.97	$29,799.61	$494,089.50
20% Overhead	$13,358.31	$30,385.51	$9,942.80	$8,755.04	$5,959.92	$68,401.58
Total Project Cost	$100,312.98	$249,970.51	$109,130.05	$67,318.01	$35,759.53	**$562,491.08**

Table 4. Estimated total expenditures for the state fiscal years of the study.

	State Fiscal Years					Totals
	FY-02	FY-03	FY-04	FY-05	FY-06	
Salaries	$13,129.52	$39,843.06	$32,735.77	$29,128.10	$24,980.95	$139,817.40
Benefits (27%)	$3,544.97	$10,757.62	$8,838.66	$7,864.59	$6,744.86	$37,750.70
In-State Travel	$2,055.03	$9,741.62	$6,000.00	$4,500.00	$5,000.00	$27,296.65
Supplies, Commun.	$4,249.85	$76,077.60	$3,670.00	$3,630.00	$3,007.00	$90,634.45
Subcontract	$0.00	$119,481.30	$59,392.00	$19,717.00	$0.00	$198,590.30
Total Direct Costs	$22,979.37	$255,901.20	$110,636.43	$64,839.69	$39,732.81	$494,089.50
20%Overhead	$4,083.88	$37,097.71	$10,248.89	$9,024.54	$7,946.56	$68,401.58
Total Project Cost	$27,063.25	$292,998.91	$120,885.32	$73,864.23	$47,679.37	**$562,491.08**

Table 5. State fiscal year 02 detailed budget (actual expenditures as of August 1, 2003).

	WTI Team			Other Direct Costs			Totals
US 93 Preconstruction Budget: State FY 02 3/1/02-6/30/02	Amanda Hardy Lead PI	John Borkowski Statistician	Student support	Travel	Operations & Communications	Equipment	Total Hours / Total Costs
Task Title	$21.33	$37.74	$9.63				
Project Management	100						100
	$2,133.00	$0.00	$0.00	$0.00	$430.00	$0.00	$2,563.00
Compile Prior Data & Lit	60.6		51				111.6
	$1,292.60	$0.00	$491.13	$0.00	$800.00	$164.55	$2,748.28
A-V Collision Monitoring	50		30				80
	$1,066.50	$0.00	$288.90	$685.01	$60.18	$0.00	$2,100.59
TDC Collaboration	100						100
	$2,133.00	$0.00	$0.00	$685.01	$100.00	$2,595.12	$5,513.13
Monitoring Evaro (& pilot)	80	174.7	30				284.7
	$1,706.40	$6,593.18	$288.90	$685.01	$100.00	$0.00	$9,373.49
Black Bear Study	32						32
	$682.56	$0.00	$0.00	$0.00	$0.00	$0.00	$682.56
TOTAL HOURS	422.6	174.7	111				708.3
LABOR COSTS	$9,013.05	$6,592.48	$1,068.96				$16,674.49
TOTAL DIRECT COSTS	$9,013.05	$6,592.48	$1,068.96	$2,055.03	$1,490.18	$2,759.67	$22,979.37
Indirect Costs at 20%	$1,802.61	$1,318.50	$213.79	$411.01	$298.04	$39.94	$4,083.88
Total State FY 02 Costs	$10,815.66	$7,910.98	$1,282.75	$2,466.04	$1,788.22	$2,799.61	**$27,063.25**

WTI subcontracted with Garcia and Associates (GANDA), a biological consultant, to assist with the initiation of the literature search, photo monitoring, field methods, and handbook.

Travel expenditures include lodging and mileage for ROC meeting, plus field work travel costs.

Operations and communications included: contracted services agreement for research on infrared cameras and GPS collars ($800); GIS consultation by Geographic Information and Analysis Center at MSU ($380); and office rent ($50).

State fiscal year 02 equipment purchased (actual expenditures as of August 1, 2003).

FY 02 Equipment	**Cost (spent)**
laptop computer	$2,595.12
software: ProCite	$164.55
TOTAL:	$2,759.67

Table 6. State fiscal year 03 detailed budget (actual expenditures as of August 1, 2003).

Budget	WTI Team					Other Direct Costs				Totals
US 93 Preconstruction Budget: State FY 03 7/1/02-6/30/03	Amanda Hardy Lead PI	Marcel Huijser Co-PI	Jeralyn Brodowy Admin	General Admin Support	Undergrad (2yrs exp)	Travel	Operations & Communications	Subcontracts	Equipment	Total Hours / Total Costs
Task Title	$23.18	$29.31	$24.17	$15.80	$8.93					
	125	80	61	40	200					506
Project Management	$2,897.50	$2,344.80	$1,474.37	$632.00	$1,786.00	$1,623.60	$500.00	$0.00	$869.77	$12,128.04
	120	120			103					343
Compile Prior Data & Lit	$2,781.60	$3,517.20	$0.00	$0.00	$919.79	$0.00	$200.00	$0.00	$50.00	$7,468.59
	51	40			80					171
A-V Collision Monitoring	$1,182.18	$1,172.40	$0.00	$0.00	$714.40	$1,623.60	$0.00	$0.00	$740.67	$5,433.25
	160	40			40					240
TDC Collaboration	$3,708.80	$1,172.40	$0.00	$0.00	$357.20	$1,623.60	$0.00	$0.00	$0.00	$6,862.00
	120	120			120					360
Monitoring Evaro (& pilot)	$2,781.60	$3,517.20	$0.00	$0.00	$1,071.60	$1,623.60	$150.00	$0.00	$16,027.09	$25,171.10
	40									40
GANDA sub-contract	$927.20	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$40,720.00	$0.00	$41,647.20
	40	10								50
Black Bear Study	$927.20	$293.10	$0.00	$0.00	$0.00	$0.00	$0.00	$78,761.30	$22,056.37	$102,037.97
	120	120			120					360
Monitoring Ravalli Curves	$2,781.60	$3,517.20	$0.00	$0.00	$1,071.60	$1,623.60	$0.00	$0.00	$16,027.09	$25,021.10
	120	120			120					360
Monitoring Ravalli Hill	$2,781.60	$3,517.20	$0.00	$0.00	$1,071.60	$1,623.60	$0.00	$0.00	$16,027.09	$25,021.10
TOTAL HOURS	1056	690	61	40	823					2670
LABOR COSTS	$24,478.08	$20,223.90	$1,474.37	$632.00	$7,349.39					$54,157.74
DIRECT COSTS	$24,478.08	$20,223.90	$1,474.37	$632.00	$7,349.39	$9,741.62	$850.00	$119,481.30	$71,798.09	$256,028.75
Indirect Costs at 20%	$4,895.62	$4,044.78	$294.87	$126.40	$1,469.88	$1,948.32	$170.00	$9,898.86	$14,120.88	$36,969.61
Total State FY03 Costs	$29,373.70	$24,268.68	$1,769.24	$758.40	$8,819.27	$11,689.94	$1,020.00	$129,380.16	$85,918.97	**$292,998.36**

Travel expenditures include round trips from MSU and Missoula to study study site and TDC meetings (lodging, mileage, per diem, MSU car rental).

Operations and communications included and office rent, phone, computer support, copier and fax, paper and office supplies.

WTI subcontracted with Garcia and Associates (GANDA), a biological consultant, to assist with the initiation of the literature search, photo monitoring, field methods, and handbook; and University of Montana to do black bear study. ** These subcontracts have indirect costs charged only on the first $25,000.

Equipment included the following items:

FY 03 Equipment	Cost (spent)
topo maps	$80.25
Skillings-Connolly US 93 survey maps	$650.00
Safety vests	$74.52
Traffic count supplies	$551.40
digital camera data card	$61.63
WTI magnetic car sign	$65.00
GPS unit	$189.27
2 2-way radios	$51.15
Software: Minitab	$50.00
Telonics GPS collars	$22,056.37
Hobo soil temp data logger, software, shuttle	$351.00
tracking bed media	$38,250.00
tracking bed filter fabric	$7,860.00
Poteet sign rental	$507.50
Poteet work zone management	$1,000.00
TOTAL	$71,798.09

Table 7. State fiscal year 04 estimated budget.

	WTI Team						Other Direct Costs				Totals
US 93 Preconstruction Budget: State FY 04 7/1/03-9/30/04	Amanda Hardy Lead PI	Marcel Huijser Co-PI	Jeralyn Brodowy Admin	General Admin Support	Undergrad (2yrs exp)	Field Technician	Travel	Operations & Communications	Subcontracts	Equipment	Total Hours / Total Costs
Task Title	$26.19	$31.65	$26.10	$16.59	$9.88	$10.00					
	80	20	60	40	20						220
Project Management	$2,095.20	$633.10	$1,566.22	$663.60	$197.60	$0.00	$1,000.00	$500.00	$0.00	$0.00	$6,655.71
	20	20			20						60
Compile Prior Data & Lit	$523.80	$633.10	$0.00	$0.00	$197.60	$0.00	$0.00	$50.00	$0.00	$0.00	$1,404.50
	10	10			10	20					50
A-V Collision Monitoring	$261.90	$316.55	$0.00	$0.00	$98.80	$200.00	$1,000.00	$0.00	$0.00	$0.00	$1,877.25
	80	20									100
TDC Collaboration	$2,095.20	$633.10	$0.00	$0.00	$0.00	$0.00	$1,000.00	$0.00	$0.00	$0.00	$3,728.30
	80	10									90
Phase I Case Study Rpt	$2,095.20	$316.55	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$2,411.75
	40	60			20	300					420
Monitoring Evaro	$1,047.60	$1,899.29	$0.00	$0.00	$197.60	$3,000.00	$1,000.00	$1,000.00	$0.00	$40.00	$8,184.49
	40	60			20	300					420
Monitoring Ravalli Curves	$1,047.60	$1,899.29	$0.00	$0.00	$197.60	$3,000.00	$1,000.00	$1,000.00	$0.00	$40.00	$8,184.49
	40	60			20	300					420
Monitoring Ravalli Hill	$1,047.60	$1,899.29	$0.00	$0.00	$197.60	$3,000.00	$1,000.00	$1,000.00	$0.00	$40.00	$8,184.49
	80	80			10						170
Field Methods Handbook	$1,854.40	$2,344.80	$0.00	$0.00	$89.30	$0.00	$0.00	$0.00	$0.00	$0.00	$4,288.50
	10										10
Black Bear Study	$261.90	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$ 59,392.00	$0.00	$59,653.90
	80	80			20	80					260
Data Summary Rpt	$2,095.20	$2,532.38	$0.00	$0.00	$197.60	$800.00	$0.00	$0.00	$0.00	$0.00	$5,625.18
TOTAL HOURS	560	420	60	40	140	1000					2220
LABOR COSTS	$14,666.40	$13,295.02	$1,566.22	$663.60	$1,383.20	$10,000.00					$41,574.43
DIRECT COSTS	$14,666.40	$13,295.02	$1,566.22	$663.60	$1,383.20	$10,000.00	$6,000.00	$3,550.00	$59,392.00	$120.00	$110,636.43
Indirect Costs at 20%	$2,933.28	$2,659.00	$313.24	$132.72	$276.64	$2,000.00	$1,200.00	$710.00	$0.00	$24.00	$10,248.89
Total State FY 04 Costs	$17,599.68	$15,954.02	$1,879.46	$796.32	$1,659.84	$12,000.00	$7,200.00	$4,260.00	$59,392.00	$144.00	**$120,885.32**

Travel expenditures include round trips from MSU and Missoula to study study site and TDC meetings (lodging, mileage, per diem, MSU car rental). Operations and communications included and office rent, phone, computer support, copier and fax, paper and office supplies. WTI subcontracted University of Montana to do black bear study. ** This subcontract has indirect costs charged only on the first $25,000. Equipment includes track bed equipment (digital camera card, rakes, weed control).

Table 8. State fiscal year 05 detailed budget.

Budget	WTI Team						Other Direct Costs				Totals
US 93 Preconstruction Budget: State FY 05 7/1/04-6/30/05	Amanda Hardy Lead PI	Marcel Huijser Co-PI	Jeralyn Brodowy Admin	General Admin Support	Undergrad (2yrs exp)	Field Technician	Travel	Operations & Communications	Subcontracts	Equipment	Total Hours / Total Costs
Task Title	$28.29	$34.19	$28.19	$17.42	$9.88	$11.00					
	80	20	60	40	20						220
Project Management	$2,262.82	$683.74	$1,691.51	$696.78	$0.00	$0.00	$1,000.00	$500.00	$0.00	$0.00	$6,834.85
	20	20			20						60
Compile Prior Data & Lit	$565.70	$683.74	$0.00	$0.00	$197.60	$0.00	$0.00	$50.00	$0.00	$0.00	$1,497.05
	10	10			10	20					50
A-V Collision Monitoring	$282.85	$341.87	$0.00	$0.00	$98.80	$220.00	$1,500.00	$0.00	$0.00	$0.00	$2,443.52
	40	40			20	320					420
Monitoring Ravalli Curves	$1,131.41	$1,367.49	$0.00	$0.00	$197.60	$3,520.00	$1,500.00	$1,500.00	$0.00	$40.00	$9,256.50
	40	40			20	320					420
Monitoring Ravalli Hill	$1,131.41	$1,367.49	$0.00	$0.00	$197.60	$3,520.00	$1,500.00	$1,500.00	$0.00	$40.00	$9,256.50
	20										20
Black Bear Study	$565.70	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$19,717.00	$0.00	$20,282.70
	80	80									160
Define MOEs	$2,262.82	$2,734.97	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$4,997.79
	80	80									160
Post-con Monitoring Plan	$2,095.20	$2,532.38	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$64,839.69
	80	80			20	80					260
Data Summary Rpt	$2,262.82	$2,734.97	$0.00	$0.00	$197.60	$880.00	$0.00	$0.00	$0.00	$0.00	$6,075.39
TOTAL HOURS	450	370	60	40	110	740					1770
LABOR COSTS	$12,728.34	$12,649.26	$1,691.51	$696.78	$1,086.80	$8,140.00					$36,992.69
TOTAL DIRECT COSTS	$12,728.34	$12,649.26	$1,691.51	$696.78	$1,086.80	$8,140.00	$4,500.00	$3,550.00	$19,717.00	$80.00	$64,839.69
Indirect Costs at 20%	$2,545.67	$2,529.85	$338.30	$139.36	$217.36	$1,628.00	$900.00	$710.00	$0.00	$16.00	$9,024.54
Total State FY 05 Costs	$15,274.01	$15,179.11	$2,029.82	$836.14	$1,304.16	$9,768.00	$5,400.00	$4,260.00	$19,717.00	$96.00	**$73,864.23**

Travel expenditures include round trips from MSU and Missoula to study study site and TDC meetings (lodging, mileage, per diem, MSU car rental). Operations and communications included and office rent, phone, computer support, copier and fax, paper and office

supplies. WTI subcontracted University of Montana to do black bear study. This subcontract has indirect costs charged only on the first $25,000. Equipment includes track bed equipment (digital camera card, rakes, weed control).

Table 9. State fiscal year 06 detailed budget.

	WTI Team						Other Direct Costs			Totals
US 93 Preconstruction Budget: State FY 06 7/1/05-6/30/06	Amanda Hardy Lead PI	Marcel Huijser Co-PI	Jeralyn Brodowy Admin	General Admin Support	Undergrad (2yrs exp)	Field Technician	Travel	Operations & Communications	Equipment	Total Hours / Total Costs
Task Title	$30.55	$36.92	$30.45	$18.29	$9.88	$12.00				
	80		60	40	20					200
Project Management	$2,443.84	$0.00	$1,826.83	$731.62	$197.60	$0.00	$1,000.00	$500.00	$0.00	$2,414.70
	20	20			22					62
Compile Prior Data & Lit	$610.96	$738.44	$0.00	$0.00	$217.36	$0.00	$0.00	$50.00	$0.00	$1,616.76
	10	10				20				40
A-V Collision Monitoring	$305.48	$369.22	$0.00	$0.00	$0.00	$240.00	$1,500.00	$0.00	$0.00	$2,414.70
	40	40			20	300				400
Monitoring Ravalli Hill	$1,221.92	$1,476.89	$0.00	$0.00	$197.60	$3,600.00	$1,500.00	$2,000.00	$57.00	$10,053.41
	240	240			40	80				600
Pre-con Synthesis Rpt	$73,315.24	$88,613.18	$0.00	$0.00	$395.20	$19,200.00	$1,000.00	$400.00	$0.00	$31,725.81
TOTAL HOURS	390	310	60	40	102	400				1302
LABOR COSTS	$11,913.73	$11,445.87	$1,826.83	$731.62	$1,007.76	$4,800.00				$31,725.81
DIRECT COSTS	$11,913.73	$11,445.87	$1,826.83	$731.62	$1,007.76	$4,800.00	$5,000.00	$2,950.00	$57.00	$39,732.81
Indirect Costs at 20%	$2,382.75	$2,289.17	$365.37	$146.32	$201.55	$960.00	$1,000.00	$590.00	$11.40	$7,946.56
Total State FY 06 Costs	$14,296.47	$13,735.04	$2,192.20	$877.94	$1,209.31	$5,760.00	$6,000.00	$3,540.00	$68.40	**$47,679.37**

Travel expenditures include round trips from MSU and Missoula to study study site and TDC meetings (lodging, mileage, per diem, MSU car rental). Operations and communications included and office rent, phone, computer support, copier and fax, paper and office supplies. Equipment includes track bed equipment (digital camera card, rakes, weed control).

REFERENCES

Becker, D.M. 1996. *Wildlife and wildlife habitat impact issues and mitigation options for reconstruction of U.S. Highway 93 on the Flathead Indian Reservation, Montana*. *In* Evink et al. (eds.) Transportation and wildlife: reducing wildlife mortality and improving wildlife passageways across transportation corridors: Proceedings of the Florida Department of Transportation/Federal Highway Administration transportation-related wildlife mortality seminar. Orlando, FL. FHWA-PD-96-041. Washington, DC: U.S. Department of Transportation, Federal Highway Administration: 85-100.

Clevenger, A. 2001. *Mitigation for impacts of roads on wildlife. In* Evink et al. (eds.) Proceedings of the International Conference on Ecology and Transportation, Keystone, Colorado: 12-14.

Fowle, S.C. 1996a. *Effects of roadkill mortality on the western painted turtle (Chrysemys picta bellii) in the Mission Valley, western Montana*. *In* Evink et al. (eds.) Transportation and wildlife: reducing wildlife mortality and improving wildlife passageways across transportation corridors: Proceedings of the Florida Department of Transportation/Federal Highway Administration transportation-related wildlife mortality seminar. Orlando, FL. FHWA-PD-96-041. Washington, DC: U.S. Department of Transportation, Federal Highway Administration: 205-223.

Fowle, S.C. 1996b. *The painted turtle in the Mission Valley of western Montana*. M.S. thesis, University of Montana. Missoula, Montana. 101 pp.Mietz, S.N. 1994. *Linkage zone identification and evaluation of management options for grizzly bears in the Evaro Hill area*. M.S. Thesis. University of Montana. Missoula, MT. 90pp.

Mietz, S.N. 1994. *Linkage zone identification and evaluation of management options for grizzly bears in the Evaro Hill area*. M.S. Thesis. University of Montana. Missoula, MT. 90pp.

Servheen, C.; Waller, J.; Kasworm, W. 1998. *Fragmentation effects of high-speed highways on grizzly bear populations shared between the United States and Canada*. *In* Evink et al. (eds.) Proceedings of the international conference on wildlife ecology and transportation. Ft. Myers, FL. Tallahassee, FL: Florida Department of Transportation: 97-103.

Singleton, P. 1998. *Wildlife-Roadway Interactions Bibliography.* US Forest Service Pacific Northwest Research Station report to Washington State Department of Transportation: 89pp. (on line at http://www.fs.fed.us/pnw/wenlab/research/projects/wildlife)